WE CLAIM:

1. An insulin-producing cell derived from a neural or neuroendocrine stem cell.
2. The insulin-producing cell of claim 1, wherein the neural or neuroendocrine stem cell is a cell from a neural or neuroendocrine stem cell line.
3. The insulin-producing cell of claim 1, wherein the insulin-producing cell is positive for one or more markers selected from the group consisting of: insulin C-peptide and glucokinase.
4. The insulin-producing cell of claim 1, wherein the insulin-producing cell does not produce glucagon, pancreatic polypeptide or somatostatin.
5. The insulin-producing cell of claim 1, wherein the insulin-producing cell is not apoptotic.
6. A cell cluster derived from neural or neuroendocrine stem cells, wherein the cell cluster comprises insulin-producing cells.
7. The cell cluster of claim 6, wherein at least 50% of the cells of the cell cluster comprise cytoplasmic insulin.
8. The cell cluster of claim 6, wherein the cell cluster further comprises at least one cell type selected from the group consisting of: glucagon producing cells, pancreatic polypeptide producing cells and somatostatin producing cells.
9. The cell cluster of claim 6, wherein at least 50% of the cells of the cell cluster are viable.
10. A method for making a cell composition comprising cells that are receptive to treatment with an islet cell differentiation factor, the method comprising culturing stem cells with a neural/endoderm caudalizing factor.
11. The method of claim 10, wherein the stem cells are neural or neuroendocrine stem cells.
12. The method of claim 11, wherein the stem cells are cells of a neural or neuroendocrine stem cell line.

13. The method of claim 10, wherein the cell composition comprises or is derived from a neural stem cell that is positive for binding to a monoclonal antibody AC133 or to a monoclonal antibody 5E12.

14. The method of claim 10, wherein the neural/endoderm caudalizing factor is caudalizing retinoic acid signaling activator.

15. The method of claim 14, wherein the caudalizing retinoic acid signaling activator is a retinoid.

16. The method of claim 14, wherein the neural/endoderm caudalizing factor is an all-trans retinoic acid or an ester, salt or free base thereof.

17. A method for making insulin-producing cells, the method comprising culturing neural or neuroendocrine stem cells in at least two different media, wherein at least one of said media comprises a neural/endoderm caudalizing factor.

18. A method for producing insulin-producing cells, the method comprising:

a. culturing human stem cells with a neural/endoderm caudalizing factor to obtain a first cell composition;

b. culturing the first cell composition, or a portion thereof, with an islet cell differentiation factor, thereby obtaining a second cell composition comprising insulin-producing cells.

19. The method of claim 18, wherein the second cell composition additionally comprises one or more of the following cell types: somatostatin producing cells, pancreatic polypeptide producing cells and glucagon producing cells.

20. A cell composition comprising insulin-producing cells prepared according to the method of claim 18.

21. The method of claim 18, wherein at least 50% of the cells of the second cell composition are not apoptotic.

22. The method of claim 18, wherein culturing the first population of cells, or a portion thereof, with an islet cell differentiation factor comprises culturing the cells with nicotinamide.

23. The method of claim 22, wherein culturing the first population of cells, or a portion thereof, with an islet cell differentiation factor comprises culturing the cells with nicotinamide and an additional factor selected from the group consisting of IGF-1, AN IGF-1 AGONIST, a PI3K inhibitor, butyric acid or a salt thereof, activin, GDF-8, GDF-11 and a hedgehog antagonist.

24. A method for assessing a test agent for islet cell differentiation factor activity, the method comprising

a. contacting cells that are receptive to treatment with an islet cell differentiation factor prepared according to the method of claim 10 with the test agent; and

b. detecting an islet cell marker,

wherein a test agent that stimulates the formation of cells expressing the islet cell marker has islet cell differentiation factor activity.

25. The method of claim 24, wherein the islet cell marker is selected from the group consisting of: insulin, pancreatic polypeptide, somatostatin, glucagon, glucokinase and insulin C-peptide.

26. A therapeutic cell composition comprising insulin-producing cells of claim 17 or 20 and a therapeutically acceptable excipient.

27. A method of ameliorating, in a subject, a condition related to insufficient pancreatic function, the method comprising administering to the subject an effective amount of insulin-producing cells produced according to the method of claim 18.

28. The method of claim 27, wherein the effective amount of insulin-producing cells causes an increase in blood insulin levels in the subject.

29. The method of claim 27, wherein the effective amount of insulin-producing cells causes an increased rate of glucose-induced insulin production in the subject.

30. The method of claim 27, wherein the subject has a diabetes caused by beta-cell insufficiency.

31. A non-human animal comprising an insulin-producing cell composition of claim 17 or 20.

32. A method for testing the developmental potential of a cell of interest, the method comprising:

a. co-culturing stem cells and one or more cells of interest through one or more culture conditions that cause the stem cells to give rise to insulin-producing cells, wherein at least one of the culture conditions include culturing in the presence of neural/endoderm caudalizing factor; and

b. determining the identity of cells derived from the cell of interest, thereby testing the developmental potential of the cell of interest.

33. The method of claim 32, wherein the cell of interest is obtained from a pancreatic tissue.

34. The method of claim 32, wherein at least one of the culture conditions includes culturing in the presence of an islet cell differentiation factor.

35. A method for testing the developmental potential of a cell of interest, the method comprising:

a. culturing one or more cells in the presence of a cellular fraction of cells prepared according to a method of claim 10, 17 or 18; and

b. determining the identity of cells derived from the cell of interest, thereby testing the developmental potential of the cell of interest.

36. A method for predicting the ability of an affinity reagent to bind to a pancreatic progenitor cell, the method comprising contacting cells prepared according to a method of claim 10, 17 or 18 with an affinity reagent, wherein an affinity reagent that binds selectively to the cells prepared according to a method of claim 10, 17 or 18 is likely to bind to a pancreatic progenitor cell.

37. The method of claim 36, wherein the affinity reagent is an antibody..

38. The method of claim 36, further comprising contacting the affinity reagent with a pancreatic or pre-pancreatic tissue sample.

39. A method for making human insulin producing cells, the method comprising:

a. culturing human neural, neuroendocrine or embryonic stem cells with a neural/endoderm caudalizing factor to obtain a first cell composition;

b. culturing the first cell composition, or a portion thereof, with an islet cell differentiation factor, thereby obtaining a second cell composition comprising insulin-producing cells.

40. The method of claim 39, wherein the neural/endoderm caudalizing factor is a caudalizing retinoic acid signaling activator.

41. The method of claim 39, wherein the neural/endoderm caudalizing factor is a retinoid.

42. The method of claim 39, wherein the neural/endoderm caudalizing factor is is an all-trans retinoic acid or an ester, salt or free base thereof.

43. The method of claim 39, wherein culturing the first population of cells, or a portion thereof, with an islet cell differentiation factor comprises culturing the cells with nicotinamide.

44. The method of claim 39, wherein culturing the first population of cells, or a portion thereof, with an islet cell differentiation factor comprises culturing the cells with nicotinamide and an additional factor selected from the group consisting of IGF-1, AN IGF-1 AGONIST, a PI3K inhibitor, butyric acid or a salt thereof, activin, GDF-8, GDF-11 and a hedgehog antagonist.

45. A method for ameliorating, in a subject, a condition related to insufficient pancreatic function, the method comprising:

a. obtaining from the subject or an HLA-matched donor a sample comprising neural or neuroendocrine stem cells;

b. culturing one or more of the neural or neuroendocrine stem cells in the presence of a neural/endoderm caudalizing factor to obtain a first cell composition;

c. culturing the first cell composition in the presence of an islet cell differentiation factor to obtain a second cell composition, wherein the second cell composition comprises insulin producing cells; and

d. administering to the subject an effective amount of insulin-producing cells.

46. The method of claim 45, wherein, prior to (b), the sample comprising neural or neuroendocrine stem cells is cultured so as to increase the number of neural or neuroendocrine stem cells.

47. The method of claim 45, wherein the sample is obtained from a tissue selected from the group consisting of: a tissue comprising cells of the peripheral nervous system, a tissue comprising cells of the central nervous system and a tissue comprising neuroendocrine cells.

48. The method of claim 45, wherein the sample is obtained by a method selected from among: trans-cranial biopsy, olfactory bulb biopsy, spinal cord biopsy and skin biopsy.

49. The method of claim 45, wherein the neural/endoderm caudalizing factor is a caudalizing retinoic acid signaling activator.

50. The method of claim 45, wherein the neural/endoderm caudalizing factor is a retinoid.

51. The method of claim 45, wherein the neural/endoderm caudalizing factor is is an all-trans retinoic acid or an ester, salt or free base thereof.

52. The method of claim 45, wherein culturing the first population of cells, or a portion thereof, with an islet cell differentiation factor comprises culturing the cells with nicotinamide.

53. The method of claim 45, wherein culturing the first population of cells, or a portion thereof, with an islet cell differentiation factor comprises culturing the cells with nicotinamide and an additional factor selected from the group consisting of IGF-1, AN IGF-1 AGONIST, a PI3K inhibitor, butyric acid or a salt thereof, activin, GDF-8, GDF-11 and a hedgehog antagonist.